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Matsumoto

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(54) **IMAGE FORMING APPARATUS**

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B65H 9/06 (2006.01)

B65H 5/02 (2006.01)

B65H 5/06 (2006.01)

B65H 5/38 (2006.01)

(52) **U.S. Cl.**

CPC **B65H 9/06** (2013.01); **B65H 5/025** (2013.01); **B65H 5/062** (2013.01); **B65H 5/38** (2013.01); **G03G 21/168** (2013.01); **G03G 21/1638** (2013.01); **G03G 21/1647** (2013.01); **G03G 21/1695** (2013.01); **B65H 2402/10** (2013.01); **B65H 2402/441** (2013.01); **B65H 2402/61** (2013.01); **B65H 2404/6111** (2013.01); **G03G 2215/00675** (2013.01); **G03G 2221/1684** (2013.01)

(58) **Field of Classification Search**

CPC G03G 21/1638; G03G 21/1695; G03G 21/1647; G03G 21/168; G03G 2221/1684

USPC 271/10.1, 4.09, 4.1; 399/121
See application file for complete search history.

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(57) **ABSTRACT**

An image forming apparatus includes a device main body, a detachable unit that is detachable and attachable to the device main body, a sheet guide that guides a pathway of sheet, and a guide position part that regulates a position of the sheet guide. The guide position part is disposed in the device main body, the sheet guide is disposed movably with respect to the detachable unit, and when the detachable unit is mounted on the device main body, a position of the sheet guide is regulated by abutting the guide position part.

18 Claims, 13 Drawing Sheets

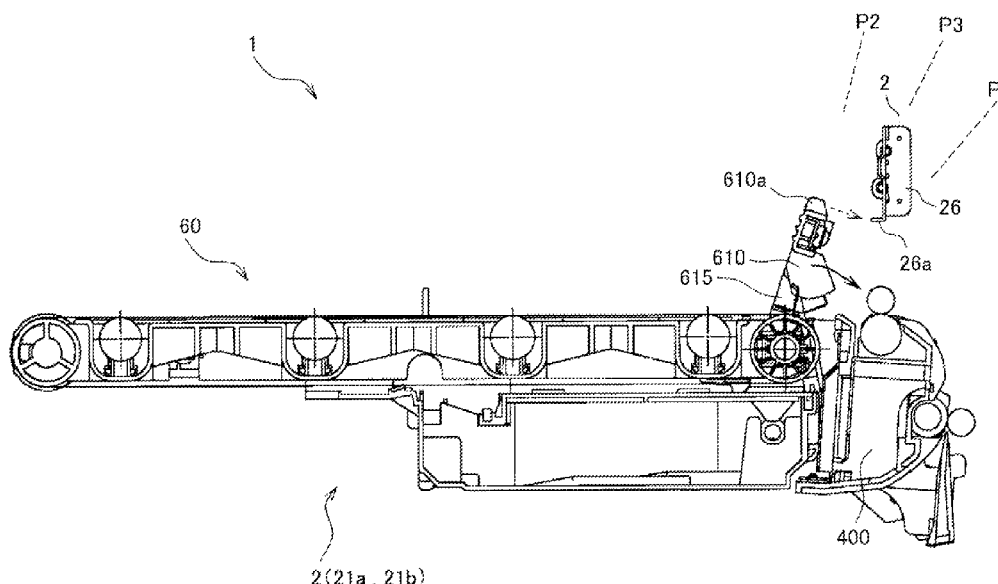


Fig. 1

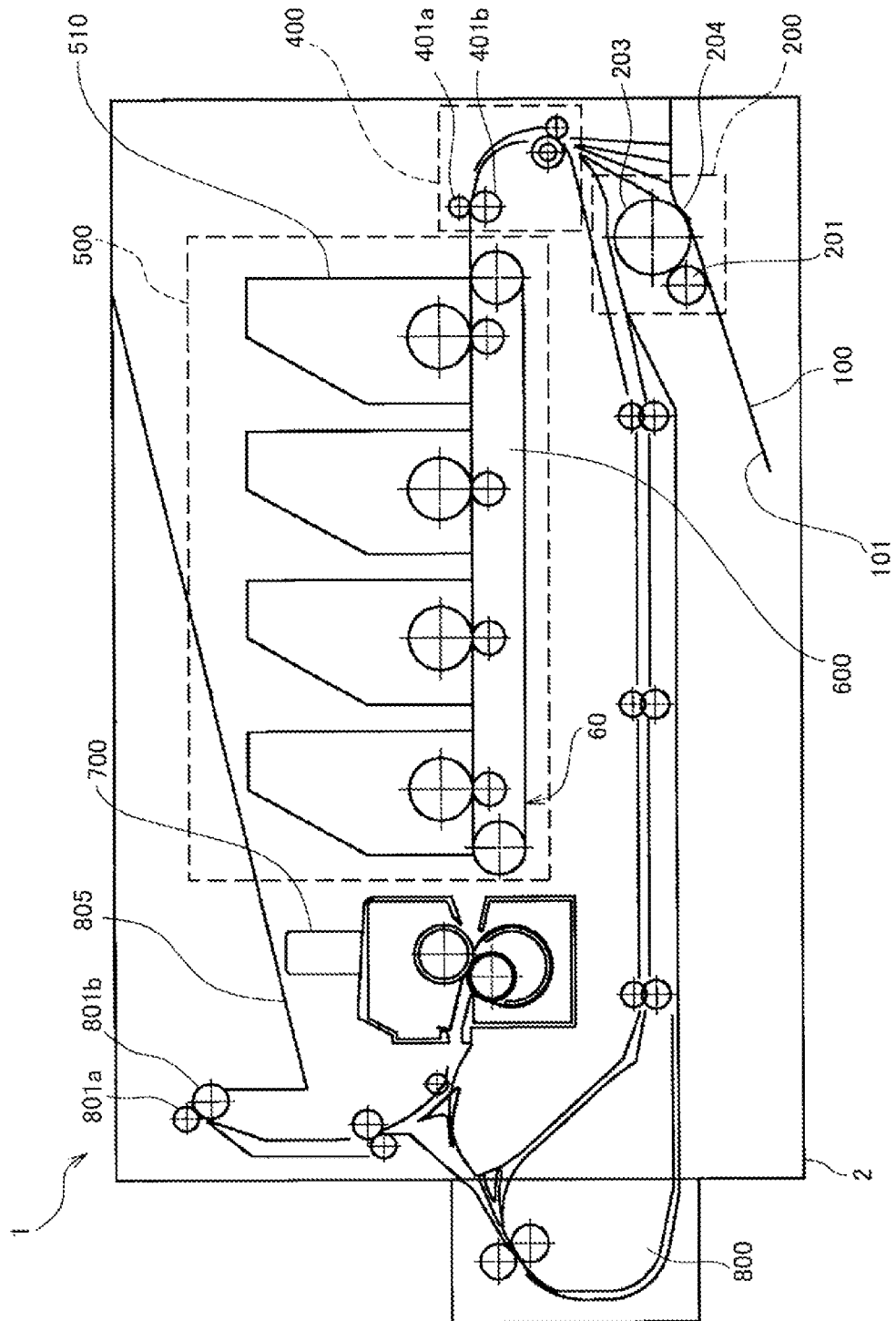


Fig. 2

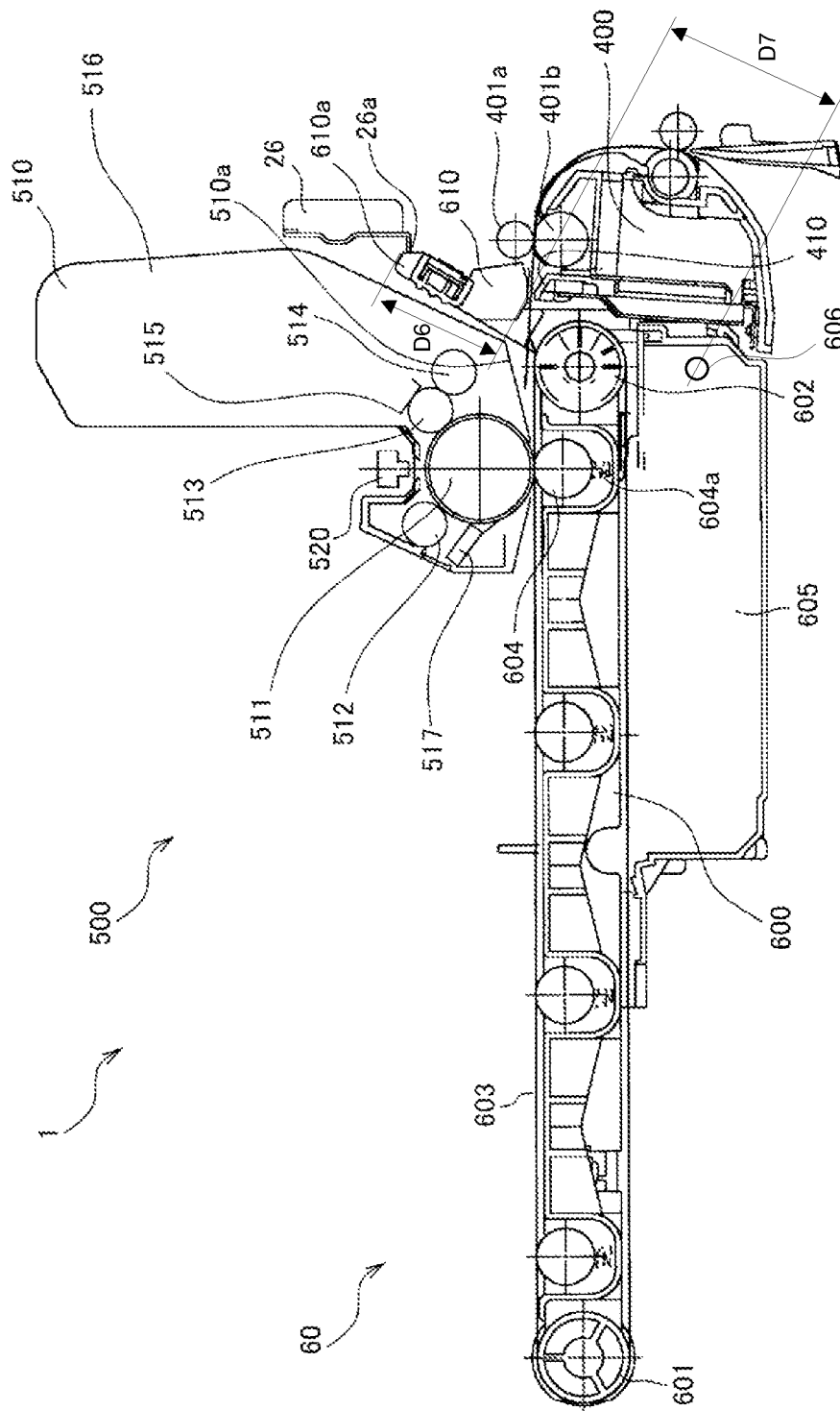


Fig. 3

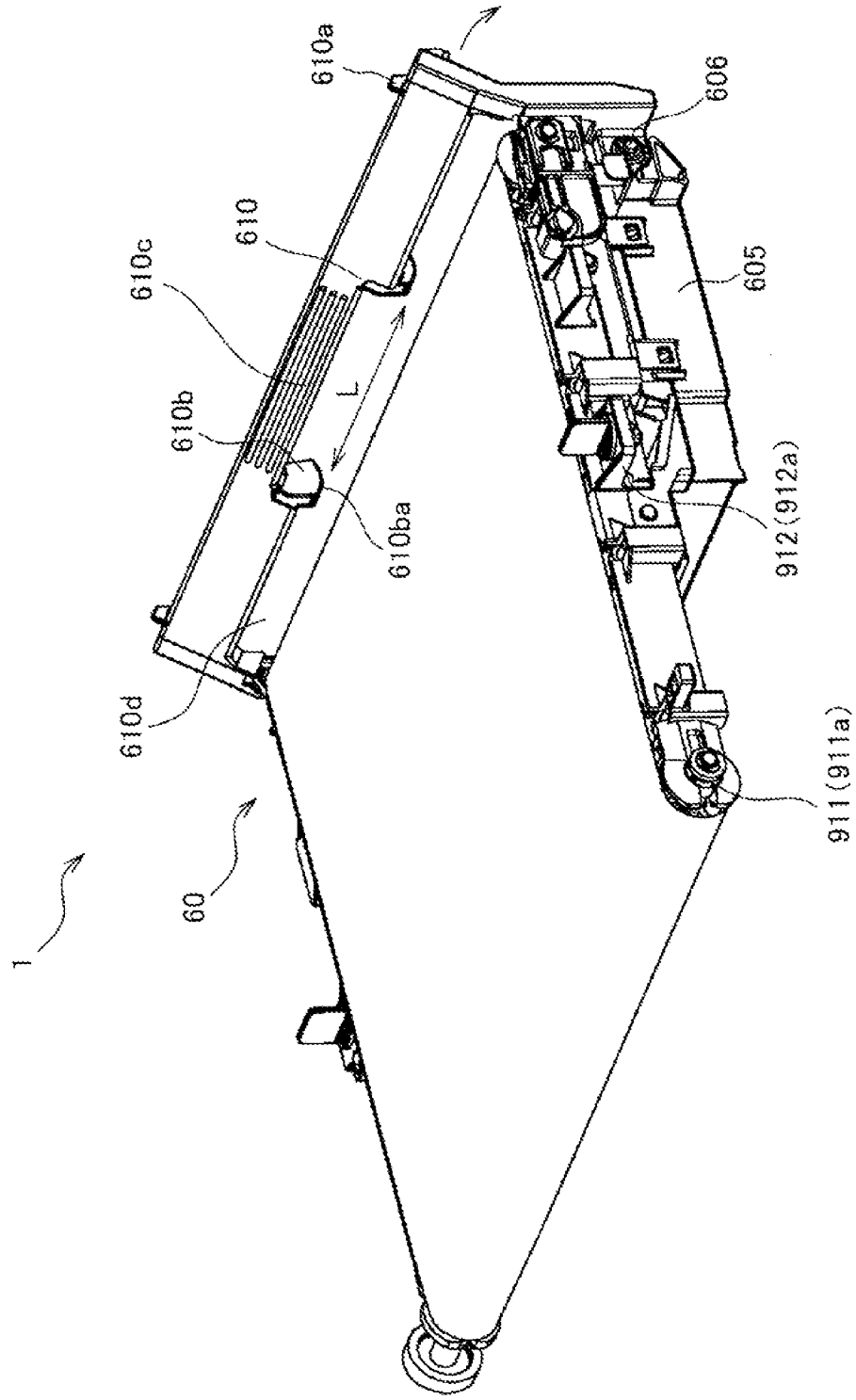


Fig. 4

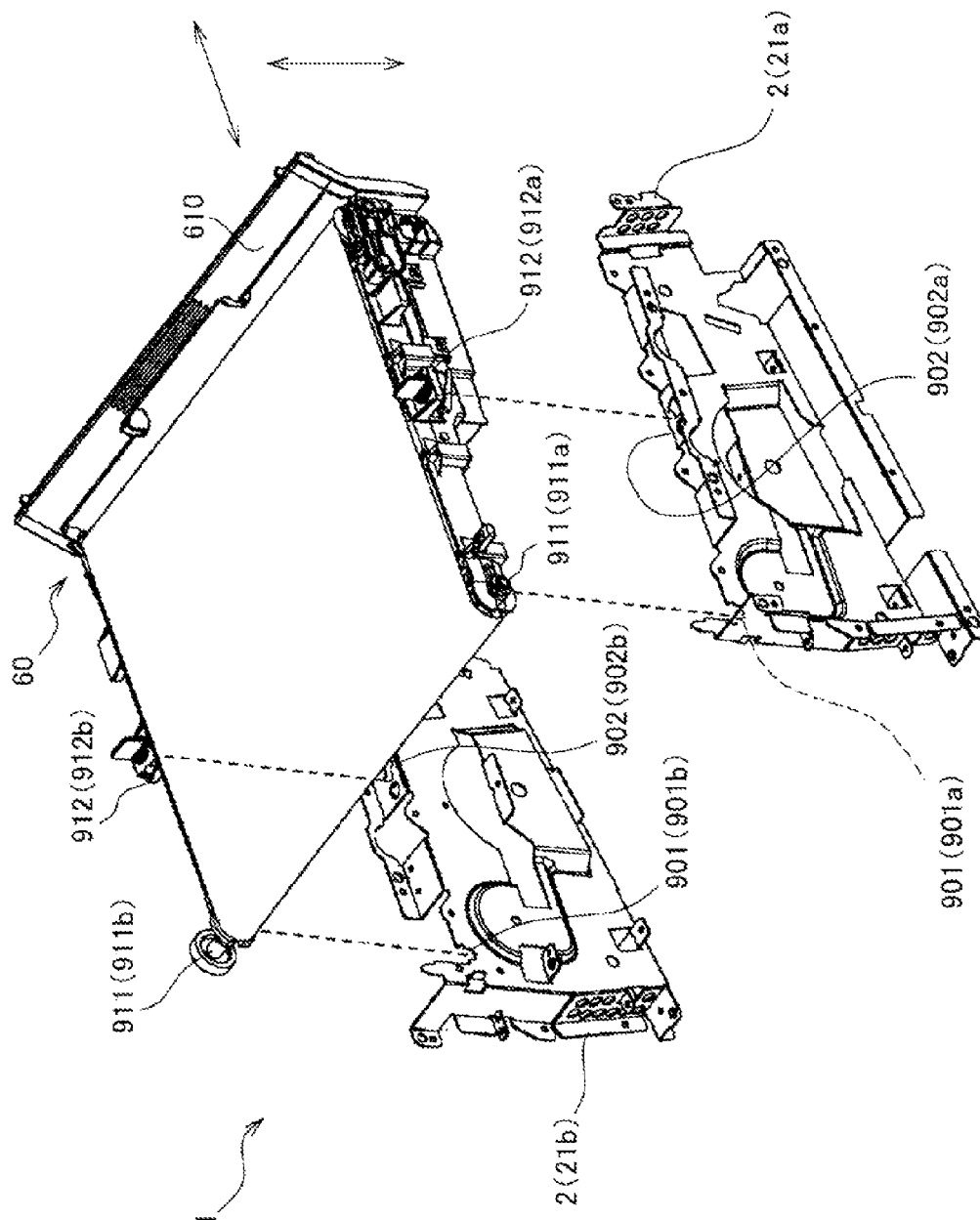


Fig. 5B

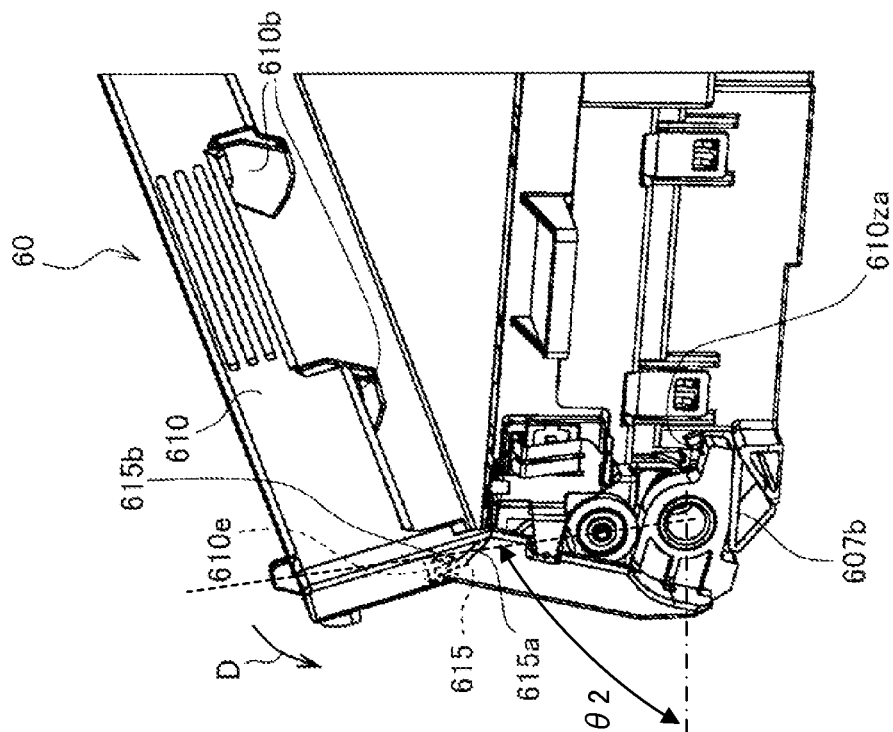


Fig. 5A

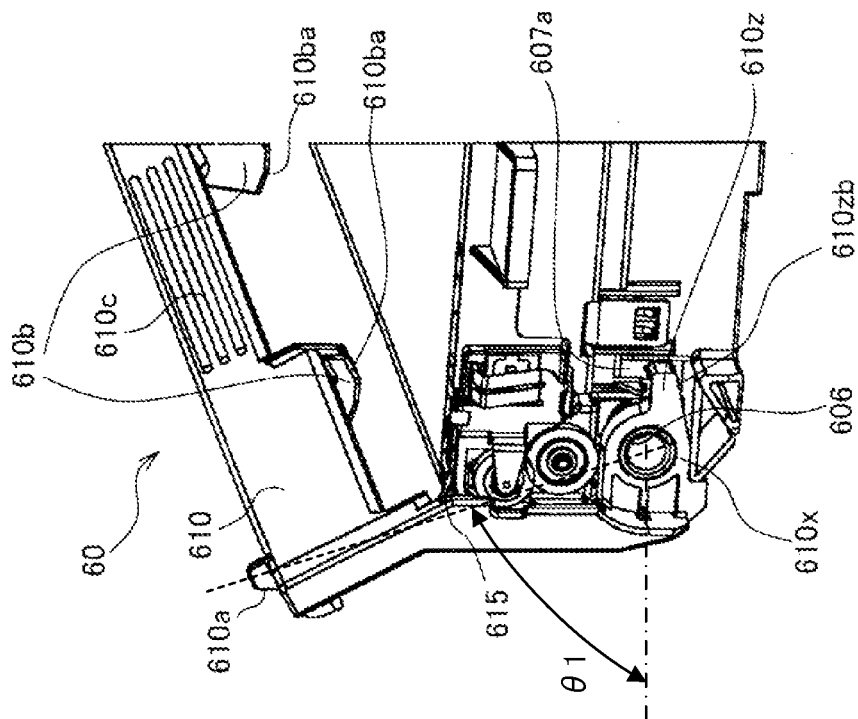


Fig. 6

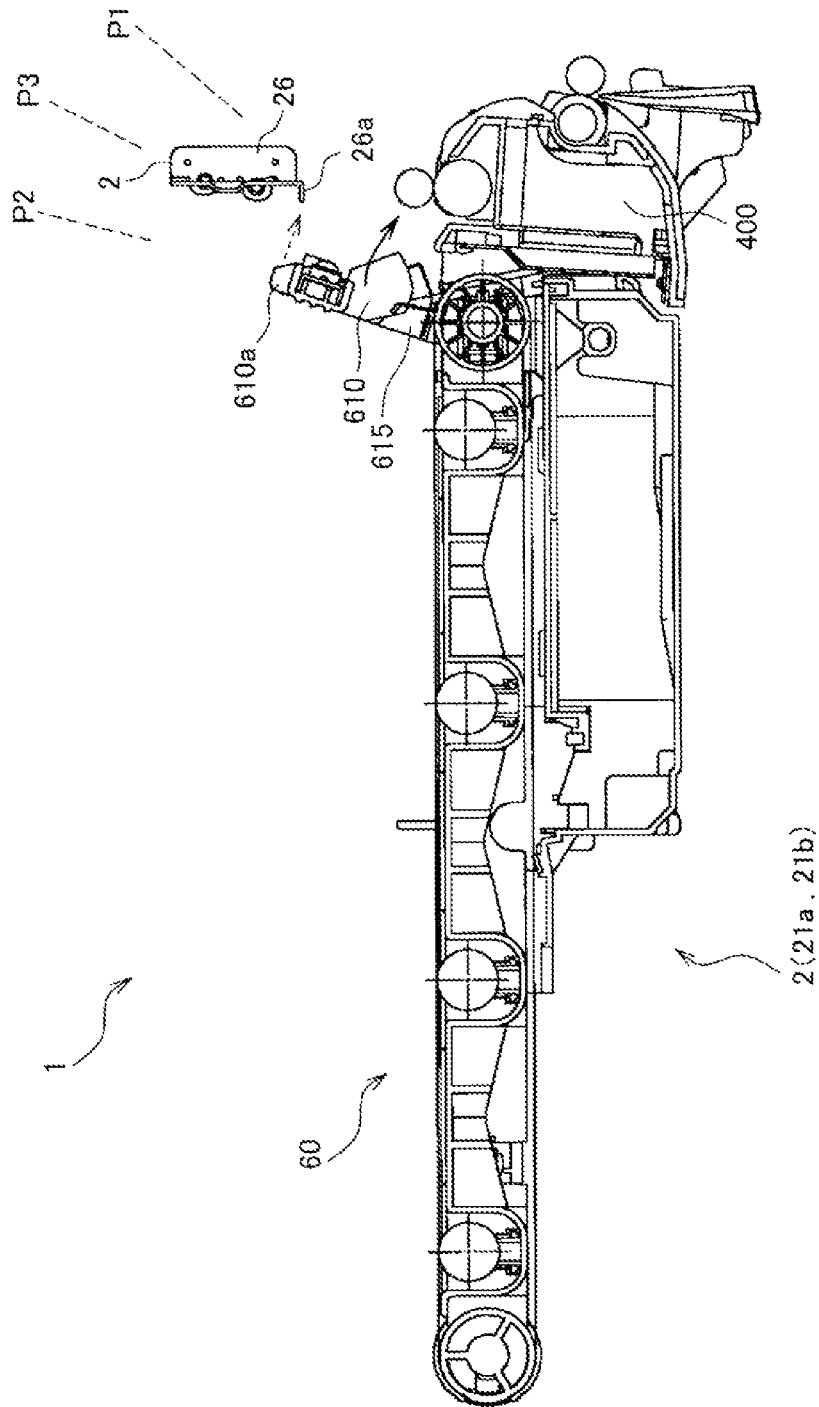


Fig. 7

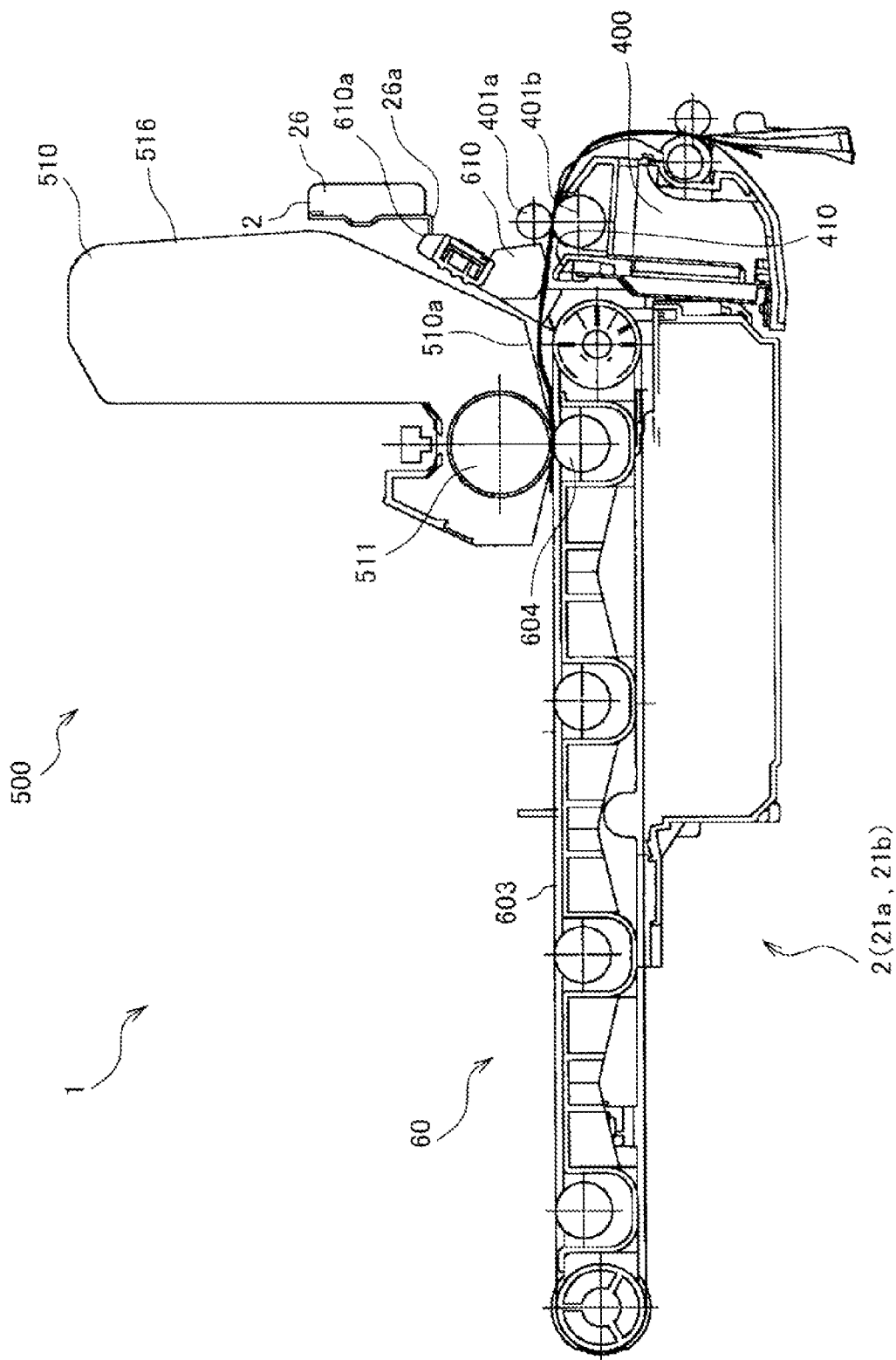


Fig. 8

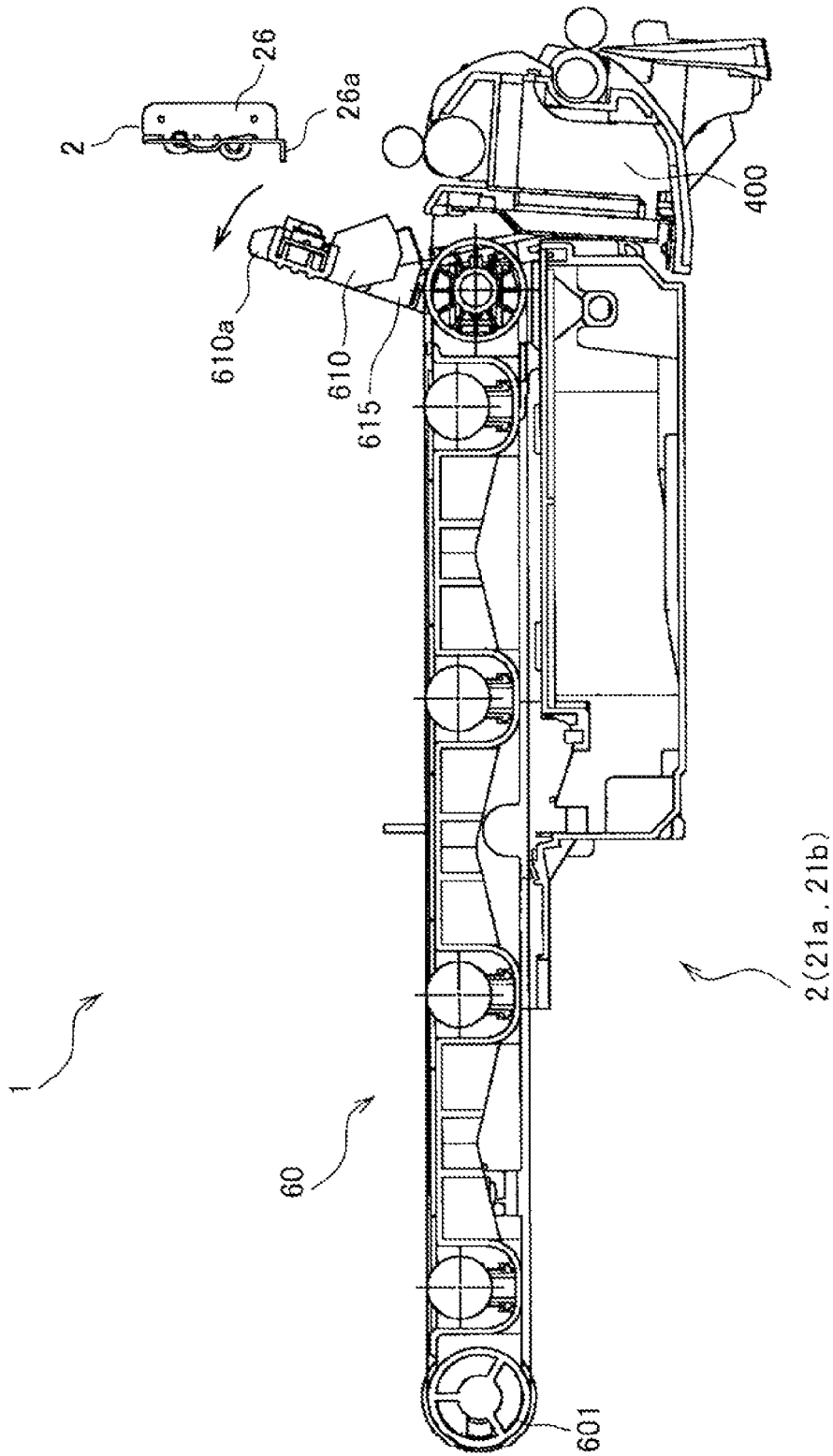


Fig. 9

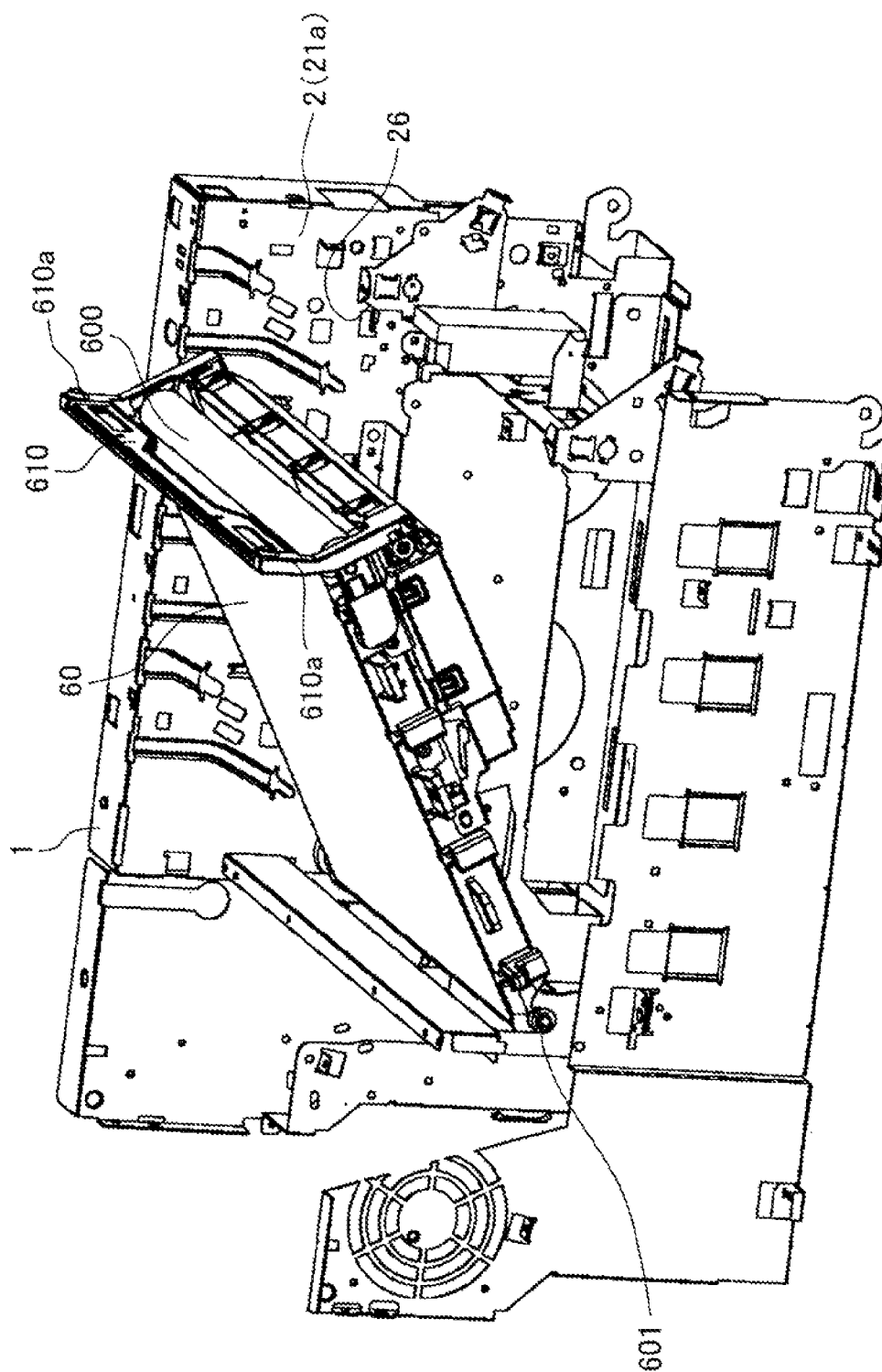


Fig. 10

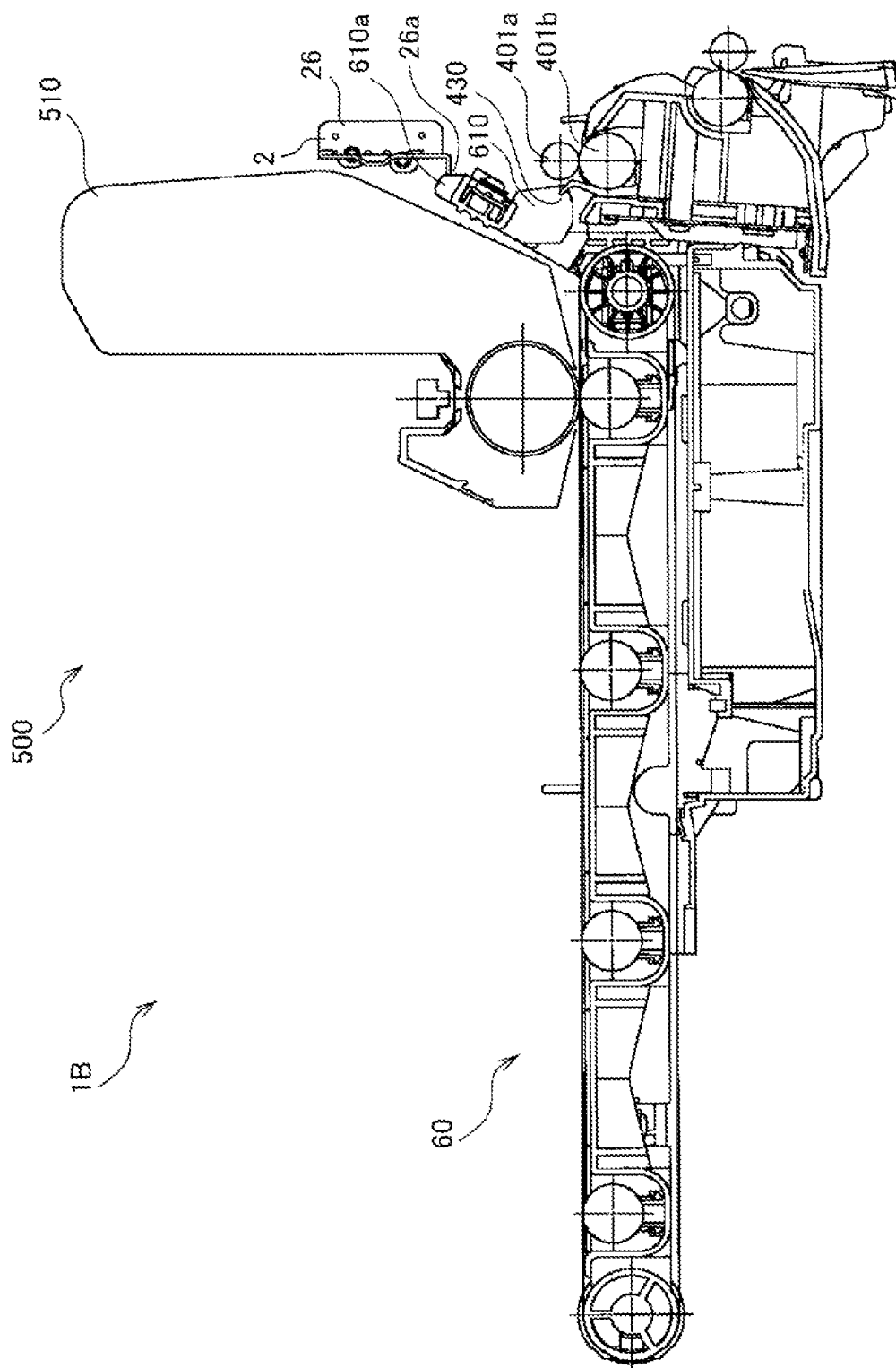


Fig. 11

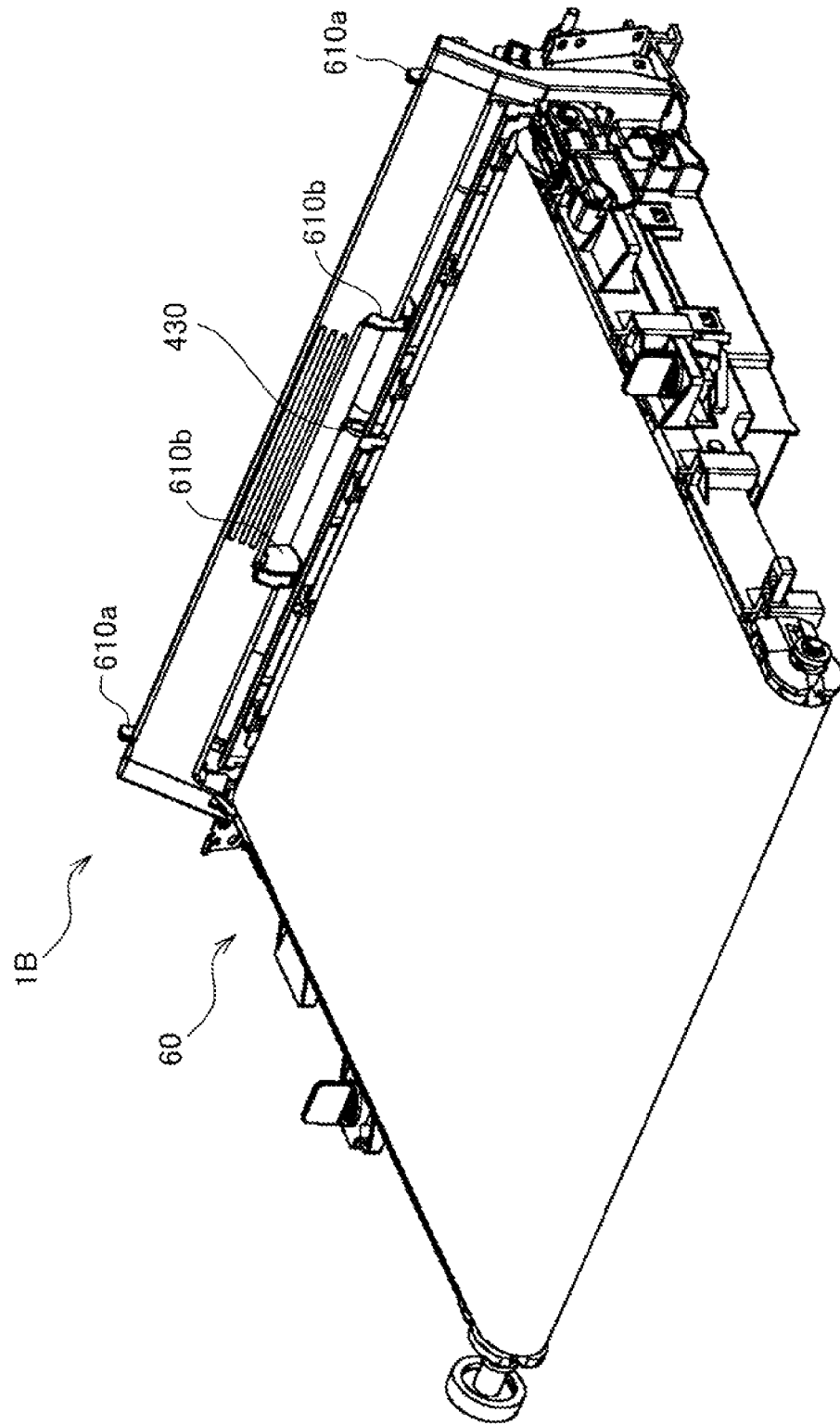


Fig. 12

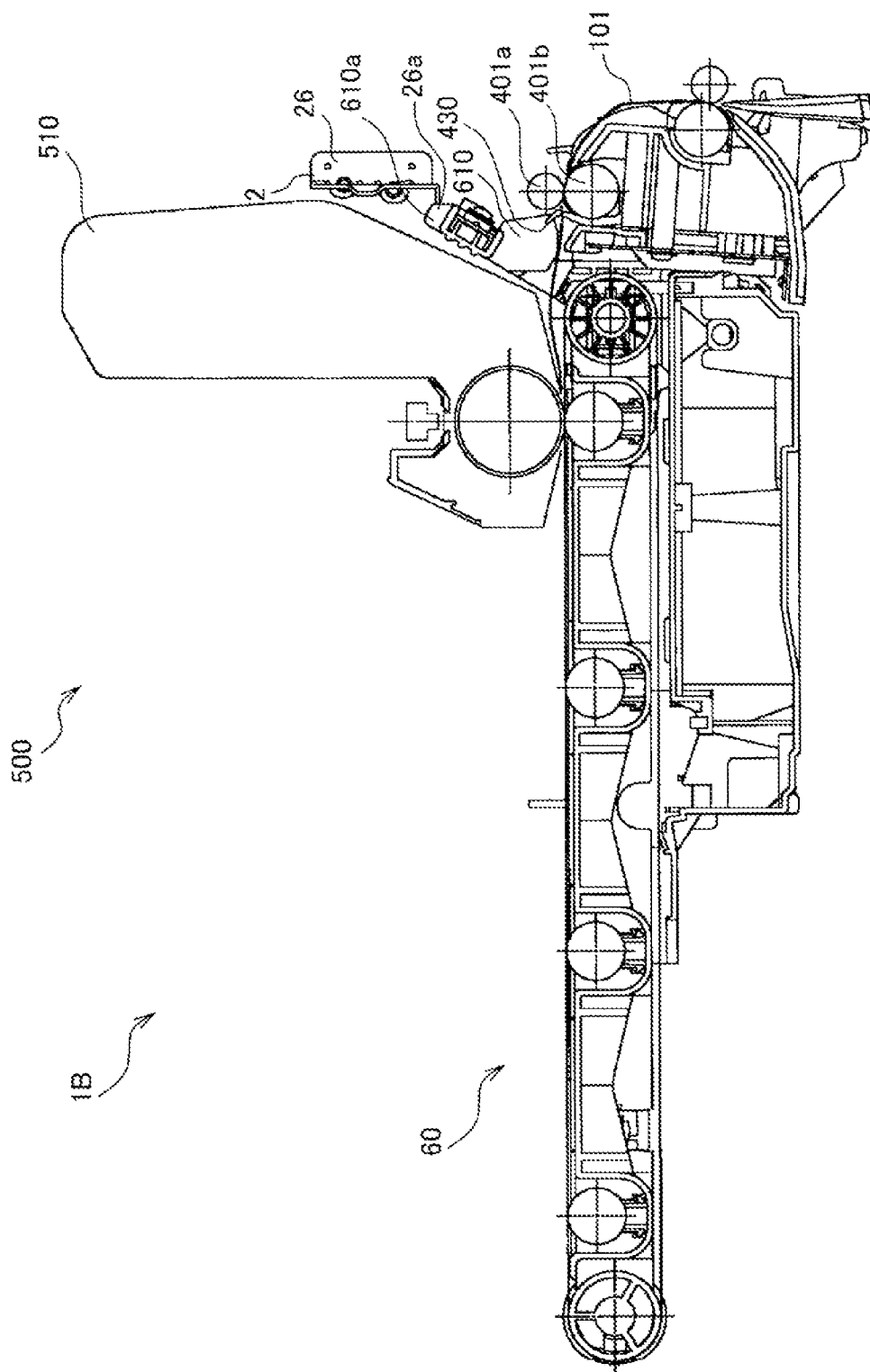
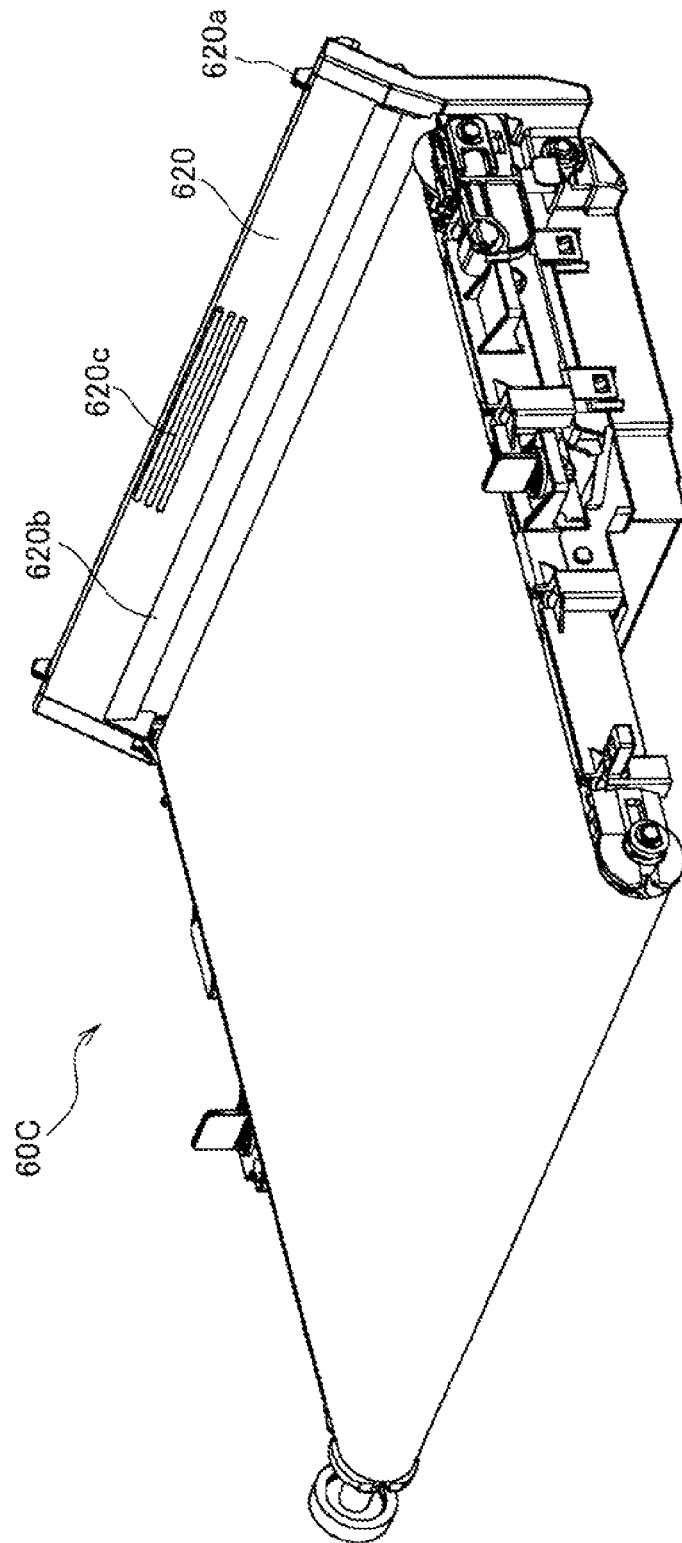


Fig. 13



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IMAGE FORMING APPARATUS

CROSS REFERENCE TO RELATED
APPLICATION

The present application is related to, claims priority from and incorporates by reference Japanese Patent Application No. 2012-186447, filed on Aug. 27, 2012.

The present invention relates to an image forming apparatus having a detachable unit to be able to attach and detach with respect to a device main body (or apparatus main body).

BACKGROUND

Conventionally, there are image forming apparatuses having a detachable unit (or detach-attach able unit) able to be able to attach and detach with respect to a device main body (for example, refer to JP2011-59578 and JP2007-101728).

However, in conventional image forming apparatuses, the sheet guide to guide the sheet to the detachable unit is disposed in the device main body. Therefore, in the conventional devices, the detachable unit and the sheet guide are respectively independently positioned. As a result, the conventional devices have a problem that the position accuracy sometimes decreases and it disturbs the sheet carrying.

The present invention is to solve the problem described above. The main purpose for this invention is to provide an image forming apparatus, wherein the detachable unit is installed in the device main body so that a sheet guide is positioned at the predetermined position at the same time.

SUMMARY

An image forming apparatus disclosed as one embodiment of the invention includes a device main body, a detachable unit that is detachable and attachable to the device main body, a sheet guide that guides a pathway of sheet, and a guide position part that regulates a position of the sheet guide. The guide position part is disposed in the device main body, the sheet guide is disposed movably with respect to the detachable unit, and when the detachable unit is mounted on the device main body, a position of the sheet guide is regulated by abutting the guide position part.

In the image forming apparatus, the sheet guide is movably disposed on the detachable unit. When the detachable unit is mounted on the device main body, the sheet guide abuts the guide position part so that the position of the sheet guide is regulated. With the structure, the image forming apparatus positions the sheet guide at a predetermined position at the same time when the detachable unit is mounted on the apparatus main body.

According to this invention, it is possible to provide the image forming apparatus, wherein the detachable unit is installed in the device main body so that a sheet guide is positioned at the predetermined position at the same time.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a view illustrating a configuration of an image forming apparatus according to the first embodiment.

FIG. 2 is a view illustrating a configuration around an image forming part of the image forming apparatus according to the first embodiment.

FIG. 3 is a view (1) illustrating a configuration of a detachable unit according to the first embodiment. The unit is in an assembled status.

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FIG. 4 is a view (2) illustrating a configuration of the detachable unit according to the first embodiment. The unit is in a breakdown status.

FIGS. 5A and 5B are views (3) illustrating configurations of the detachable unit according to the first embodiment.

FIG. 6 is a view (1) illustrating a movement of the image forming apparatus according to the first embodiment.

FIG. 7 is a view (2) illustrating a movement of the image forming apparatus according to the first embodiment.

FIG. 8 is a view (3) illustrating a movement of the image forming apparatus according to the first embodiment.

FIG. 9 is a view (4) illustrating a movement of the image forming apparatus according to the first embodiment.

FIG. 10 is a view (1) illustrating a configuration of an image forming apparatus according to the second embodiment.

FIG. 11 is a view (2) illustrating a configuration of the image forming apparatus according to the second embodiment.

FIG. 12 is a view illustrating a movement of the image forming apparatus according to the second embodiment.

FIG. 13 is a view illustrating a configuration of a detachable unit according to the modification example.

DETAILED DESCRIPTION OF EMBODIMENTS

Hereinafter, referring to figures, the embodiment of the present invention (hereinafter referred to as “the embodiment”) is explained in details. Each figure is schematically illustrating the present invention well enough to understand. Therefore, the present invention is not limited to the illustrated examples. Also, in each figure, the common component and the same component are showed with the same marks, and those repeated explanations are omitted.

First Embodiment

Configuration of Image Forming Apparatus

Referring to FIG. 1, the configuration of the image forming apparatus according to the first embodiment is explained. FIG. 1 is a view illustrating the configuration of the image forming apparatus according to the first embodiment. Here, assuming that the image forming apparatus 1 is configured as a tandem style direct transfer method color printer, the embodiment is explained. Also, “upstream” and “downstream” explained below are based on the carrying direction of the sheet.

As illustrated in FIG. 1, the image forming apparatus 1 according to the first embodiment is provided with the sheet tray 100, the sheet delivery part 200, the sheet carrying part 400, the image forming part 500, the fuser part 700, and the reverse part 800 inside the frame configures the case of the device main body (hereinafter “the main body frame”).

The sheet tray 100 is a contain part to contain the sheet 101 as a print medium. In the sheet tray 100, the sheets 101 are laminated inside. In the sheet tray 100, the sheet delivery part 200 is disposed at the delivery side.

The sheet delivery part 200 is a mechanism to deliver the sheets 101 to the downstream side one by one. The sheet delivery part 200 is provided with the pickup roller 201, the feed roller 203, and the separation piece 204. The pickup roller 201 is a roller to contact and press against the sheet 101 raised to the certain height by a bias method (not illustrated) and delivers the sheet 101 to the downstream side. The feed roller 203 and the separation piece 204 are components to

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separate the sheets **101** one by one by putting the sheet **101** delivered by the pickup roller **201** therebetween.

The sheet carrying part **400** is a mechanism to carry the sheet **101** delivered by the sheet delivery part **200** to the image forming part **500**. In the first embodiment, the sheet carrying part **400** has a configuration to curve the sheet **101** and carry the sheet **101** toward the image forming part **500**. The sheet carrying part **400** is provided with plural pairs of the sheet carrying rollers **401a** and **401b**. One of the sheet carrying rollers **401a** and **401b** is configured as a driving roller, and the other is configured as a driven roller. The sheet carrying rollers **401a** and **401b** carry the sheet **101** to the image forming part **500** by putting the sheet **101** between them while one of the rollers configured as a driving roller is rotating.

The image forming part **500** is a mechanism to form the image to transfer to the sheet **101**. The image forming part **500** is provided with the toner image forming part **510** and the transfer part **600**. The toner image forming part **510** is a mechanism to form the image (toner image) on the surface of the photosensitive drum **511** (refer to FIG. **2**) disposed inside based on the print data sent from the host device (not illustrated) using the toner that is a developer. The transfer part **600** is a mechanism to transfer the image (toner image) formed on the surface of the photosensitive drum **511** to the surface of the sheet **101** by the Coulomb force. The configuration around the image forming part **500** is described later. The image forming part **500** carries the sheet **101** to which the toner image is transferred to the fuser part **700**.

In the first embodiment, the toner image forming part **510** has a detachable configuration (to be able to attach and detach) with respect to the main body frame **2** (hereinafter, sometimes referred to as a "device main body"). Also, in the first embodiment, in the image forming apparatus **1**, four of the toner image forming parts **510** corresponding to each color of black (K), yellow (Y), magenta (M), and cyan (C) are disposed. The four toner image forming parts **510** are disposed to tandemly line up from the upstream side toward the downstream side. Four toner image forming parts **510** have the same configuration except that the colors of the developers contained inside are different.

Also, in the first embodiment, the transfer part **600** is configured as a sheet carrying unit to carry the sheet **101**. Then, the transfer part **600** as a sheet carrying unit is configured as a detachable unit **60** to be able to attach and detach with respect to the main body frame **2** (device main body).

The fuser part **700** is a mechanism to heat and pressurize the sheet **101** and to secure the toner image transferred to the surface of the sheet **101** by melting. The image forming apparatus **1** ejects the sheet **101** toward the stack part **805** by the ejection rollers **801a** and **801b** after the toner image is secured on the sheet **101** by the fuser part **700**. The stack part **805** is a part to stack the sheet **101** on which the toner image is secured. In the example illustrated in FIG. **1**, the stack part **805** is disposed at the exterior part of the image forming part **500** of the upper part of the image forming part **500**. The sheet **101** is ejected on the stack part **805** through an ejection opening (not illustrated).

The reverse part **800** is a mechanism to reverse the sheet **101** when the double sided printing is conducted. The reverse part **800** reverses the sheet **101** ejected from the fuser part **700** and sends it back to the sheet carrying part **400**. The sheet carrying part **400** carries the reversed sheet **101** to the image forming part **500**. In the image forming part **500**, the toner image forming part **510** forms the toner image on the surface of the photosensitive drum **511**, and the transfer part **600** transfers the image formed on the surface of the photosensitive drum **511** to the back surface of the sheet **101**. The image

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forming part **500** carries the sheet **101** on which the toner image is transferred toward the fuser part **700** again. As a result, the fuser part **700** heats and pressurizes the sheet **101** and secures the toner image transferred to the back surface of the sheet **101** by melting. The image forming apparatus **1** carries the sheet **101** by the ejection rollers **801a** and **801b** and ejects the sheet **101** on the stack part **805** after the toner image is secured on the sheet **101**.

Configuration Around Image Forming Part

Referring to FIG. **2** to FIG. **5B**, the configuration around the image forming part **500** is explained. FIG. **2** is a view illustrating the configuration around the image forming part **500** of the image forming apparatus **1** according to the first embodiment. Also, FIGS. **3**, **4**, and **5** are views respectively illustrating the configuration of the detachable unit **60** according to the first embodiment.

As described above, the image forming part **500** is provided with the toner image forming part **510** and the transfer part **600**. The undersurface of the case of the toner image forming part **510** is formed as a flat slope surface, and the slope surface functions as the guide surface **510a** to guide the traveling of the sheet **101**. The toner image forming part **510** has a configuration to be able to attach and detach with respect to the main body frame **2** (device main body) as described above. Also, in the first embodiment, the transfer part **600** is configured as the sheet carrying unit to carry the sheet **101** and the detachable unit **60** to be able to attach and detach with respect to the main body frame **2** (device main body) as described above.

As illustrated in FIG. **2**, the toner image forming part **510** is provided with the photosensitive drum **511**, the charge roller **512**, the development roller **513**, the supply roller **514**, the development blade **515**, the toner container part **516**, and the cleaning member **517**. Also, in the image forming apparatus **1**, the LED head **520** is established outside of the toner image forming part **510**, around the photosensitive drum **511**, and between the charging roller **512** and the development roller **513**.

The photosensitive drum **511** is a member on the surface of which the electrostatic latent image and the toner image are formed. The charge roller **512** is a member to equally charge the surface of the photosensitive drum **511**. In the image forming apparatus **1**, the charge roller **512** equally charges the surface of the photosensitive drum **511**. After that, the LED head **520** partially exposes the surface of the photosensitive drum **511** based on the print data sent from the host device (not illustrated). Thereby, the image forming apparatus **1** forms the electrostatic latent image on the surface of the photosensitive drum **511**.

The development roller **513** is a developer carrier to hold the toner as a developer on the surface. The development roller **513** supplies the toner to the photosensitive drum **511** on which the electrostatic latent image is formed and develops (visualizes) the electrostatic latent image as the toner image. The supply roller **514** is a member to supply the toner to the development roller **513**. The development blade **515** is a member to regulate the layer thickness of the toner adhered on the surface of the development roller **513**. The toner container part **516** is a space to contain the toner to supply to the supply roller **514**.

The cleaning member **517** is a member to contact the surface of the photosensitive drum **511** and scrape the remaining toner from the surface of the photosensitive drum **511**. Here, "the remaining toner" means the toner remained on the surface of the photosensitive drum **511** after the transfer part

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600 conducts the transfer treatment of the toner from the photosensitive drum 511 to the sheet 101. The LED head 520 is a exposure part to irradiate light on the surface of the photosensitive drum 511 and partially expose the surface of the photosensitive drum 511 based on the print data sent from the host device (not illustrated). The image forming apparatus 1 can use a laser light source and the like instead of the LED head 520.

Also, the transfer part 600 is provided with the belt rollers 601 and 602, the carrying belt 603, the transfer roller 604, the spring 604a, the waste toner box 605, and the sheet guide 610.

The belt rollers 601 and 602 are a pair of rollers that extend the carrying belt 603 between them and provide a tension to the rollers. One of the belt rollers 601 and 602 is configured as a driving roller, and the other is configured as a driven roller. The belt rollers 601 and 602 make the carrying belt 603 run when one of the rollers configured as a driving roller rotates.

The carrying belt 603 is an endless belt member to carry the sheet 101. In the first embodiment, four toner image forming parts 510 are arranged on the carrying belt 603. The carrying belt 603 carries the sheet 101 so that the sheet 101 passes between the photosensitive drums 511 of the four image forming parts 510 and the four transfer rollers 604 arranged to face each of the photosensitive drums 511.

The transfer roller 604 is a member to pull the toner image formed on the surface of the photosensitive drum 511 by the Coulomb force. The transfer roller 604 is arranged to face the photosensitive drum 511 via the carrying belt 603. In the first embodiment, the image forming apparatus 1 has four toner image forming parts. Therefore, the image forming apparatus 1 has a configuration that four transfer rollers 604 are arranged to respectively face the photosensitive drums 511 of four toner image forming parts 510. The spring 604a is a member to push the transfer roller 604 to the photosensitive drum 511 side.

The waste toner box 605 is a container to contain the toner to discard (waste toner). In the image forming apparatus 1, the cleaning member (not illustrated) is disposed above the waste toner box 605. The cleaning member (not illustrated) scrapes the toner adhered on the carrying belt 603 from the carrying belt 603 after the transfer treatment. The waste toner box 605 contains the toner scraped by the cleaning member (not illustrated) as the waste toner.

The sheet guide 610 is a member to guide the traveling of the sheet 101 by putting the sheet 101 between the sheet guide 610 and the carrying part guide 410 described later. The sheet guide 610 is arranged between the sheet carrying part 400 and the toner image forming part 510 of the most upstream side of the image forming part 500.

In this embodiment, the image forming apparatus 1 has a configuration that the sheet carrying part 400 makes the sheet 101 curve and carries the sheet 101 toward the toner image forming part 510 of the most upstream side of the image forming part 500. Therefore, the sheet 101 easily lifts up before it gets to the toner image forming part 510 of the most upstream side. The sheet guide 610 pushes the sheet 101 from top and prevents the sheet 101 from lifting up by curve-carrying.

The sheet guide 610 is movably disposed in the detachable unit 60, the sheet guide 610 contacts the guide position part 26a described later (referring to FIG. 2) when the detachable unit 60 is installed in the main body frame 2, and the position of the sheet guide 610 is regulated.

In the first embodiment, as illustrated in FIG. 3, the shaft of the sheet guide 610 is supported by the shaft part 60 disposed in the waste toner box 605 of the detachable unit 60. Therefore, in the first embodiment, the sheet guide 610 has a con-

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figuration to be able to rotate and move around the shaft part 606. When the detachable unit 60 is installed in the main body frame 2, the sheet guide 610 has a configuration that the abutment part 610a described later contacts the guide position parts 26a (referring to FIG. 2), and the position of the abutment part 610a is determined.

As illustrated in FIG. 3, the sheet guide 610 is formed so that the part the sheet 101 passes is opened as the aperture part 610d. Also, the sheet guide 610 is provided with the abutment part 610a, the guide part 610b, and the grip part 610c.

As illustrated in FIG. 2, the abutment part 610a is a part on which the tip of the protrusion part 26a of the sheet metal 26 (described later) abuts. The sheet metal 26 is disposed in the main body frame 2 arranged at the upstream side. The abutment part is formed protruding in the direction of the sheet metal 26 (refer to FIG. 2).

The guiding part 610b is a part to contact the sheet 101 carried by the sheet carrying part 400 and guide the traveling of the sheet 101. The guide part 610b is formed so as to protrude toward the lower direction from the grip part 610c (that is, the inside direction of the aperture part 610d). The undersurface of the lower end part of the guide part 610b is formed as the guide surface 610ba. The guide surface 610ba is the surface to contact the upper surface of the sheet 101. The guide surface 610ba is formed in the round shape (or curved shape).

The handle part 610c is a grip part gripped by the user. By gripping the handle part 610c, the user can lift the detachable unit 60. The handle part 610c is disposed above the aperture part 610d.

In the example illustrated in FIG. 3, two guide parts 610b are disposed at both sides of the handle part 610c. Here, the distance (interval) between two guide parts 610b is defined as L and used in the explanation. The distance L is set to be narrower value than the width of the sheet 101 that the image forming apparatus 1 can carry. For example, the distance L may be set to be the value of about 100 mm when the width of the sheet 101 that the image forming apparatus 1 can carry is 148 mm. Also, the distance L may be set to be the narrower value than the width of the sheet 101 that is a regular sized sheet and the smallest size on which the image forming apparatus 1 can print. Also, the distance L may be set to be the narrower value than the width of the sheet 101 on which the image forming apparatus 1 can print both sides when the image forming apparatus 1 is a device that can print both sides.

In the first embodiment, as illustrated in FIG. 2, in the image forming apparatus 1, the carrying part guide 410 is disposed in the sheet carrying part 400. The carrying part guide 410 is a member to guide the traveling of the sheet 101 by putting the sheet 101 between the carrying part guide 410 and the sheet guide 610. The carrying part guide 410 is disposed at the position that the upper end part of the carrying part guide 410 faces the guide surface 610ba (described later) formed on the sheet guide 610.

Also, in this embodiment 1, as illustrated in FIG. 2, the sheet metal 26 is disposed in the main body frame 2. The sheet metal 26 is a contact member to contact the sheet guide 610. A part of the sheet metal 26 is formed as the protrusion part 26a protruding in the direction of the sheet guide 610. The tip of the protrusion part 26a abuts the abutment part 610a of the sheet guide 610. Thereby, the sheet metal 26 positions the abutment part 610a of the sheet guide 610 at the predetermined position (the third position P3 described later (refer to FIG. 6)). Hereinafter, the protrusion part 26a of the sheet metal 26 is referred to as the "guide position part 26a."

In this embodiment 1, in the image forming apparatus 1, the carrying part guide 410 is arranged between the shaft part 606 and the guide surface 610ba of the sheet guide 610 so as to face the guide surface 610ba with the predetermined interval. Also, the guide surface 610ba (refer to FIG. 3) is arranged so as to position between the guide position part 26a (refer to FIG. 2) and the shaft part 606 (refer to FIG. 3). Furthermore, the guide surface 610ba (refer to FIG. 3) is arranged so that a distance D6 from the guide surface 610ba (refer to FIG. 3) to the guide position part 26a (refer to FIG. 2) is shorter than another distance D7 from the guide surface 610ba (refer to FIG. 2) to the shaft part 606 (refer to FIG. 3). The distances D6 and D7 are shown in FIG. 2.

By arranging each configuration element in such way, the image forming apparatus 1 can decrease the change of the positional relation between the guide surface 610ba (refer to FIG. 3) and the carrying part guide 410 (refer to FIG. 2) accompanied by the attachment error or the manufacturing error of the guide position part 26a (refer to FIG. 2) in the carrying direction of the print medium.

Also, in the first embodiment, as illustrated in FIG. 4, the image forming apparatus 1 has the side frames 21a and 21b to configure the side parts of the main body frame 2. The ditch part 901a and the abutment part 902a are disposed on the side frame 21a. Also, the ditch part 901b and the abutment part 902b are disposed on the side frame 21b. Also, in the image forming apparatus 1, the first engagement parts 911a and 911b and the second engagement parts 912a and 912b are disposed on the detachable unit 60.

The ditch part 901a of the side frame 21a is a part to engage with the first engagement part 911a disposed on the detachable unit 60. Also, the ditch part 901b of the side frame 21b is a part to engage with the first engagement part 911b disposed on the detachable unit 60. The ditch parts 901a and 901b are formed so that the corresponding first engagement parts 911a and 911b fit inside. Hereinafter, the ditch parts 901a and 901b are sometime referred to as “the ditch part 901” together. Also, the first engagement parts 911a and 911b are sometimes referred to as “the first engagement part 911” together. The first engagement part 911 fit inside of the ditch part 901, so the ditch part 901 functions as a horizontal direction position regulation part to regulate the position toward the sheet metal 26 of the detachable unit 60, that is, the horizontal direction position of the detachable unit 60. In the embodiment, the ditch part 901 was described to regulate a movement of the sheet metal 26 in the horizontal direction. However, it is not necessary to interpret the direction exactly perpendicular to gravity. In the light of the invention, it is proper to read that the horizontal direction means a parallel direction along a sheet carrying direction or the same direction as a driving surface of the carrying belt (for example carrying belt 603). Further, it is noted that, where the image forming apparatus is installed in a vertical way, which is upright, the horizontal direction above means a vertical direction according to the direction in which the sheet is carried. It is also noted that, where the image forming apparatus is installed with an angle (or inclined), the horizontal direction inclines accordingly. Therefore, the horizontal direction position regulation part may be defined as a sheet carrying direction regulation part that functions to regulate it in the sheet carrying direction.

The abutment part 902a of the side frame 21a is a part to engage with the second engagement part 912a disposed on the detachable unit 60. Also, the abutment part 902b of the side frame 21b is a part to engage with the second engagement part 912b. The abutment parts 902a and 902b are formed so that the corresponding second engagement parts 912a and 912b mount on the abutment parts 902a and 902b, and the

abutment parts 902a and 902b support the second engagement part 912a and 912b from bottom. Hereinafter, the abutment parts 902a and 902b are sometimes referred to as “the abutment part 902” together. Also, the second engagement parts 912a and 912b are sometimes referred to as “the second engagement part 912” together. The abutment part 902 functions as the vertical direction position regulation part to regulate the vertical direction position of the detachable unit 60 by supporting the second engagement part 912 from bottom. In the embodiment, the abutment part 902 was described to regulate a movement of the detachable unit 60 in the vertical direction. However, it is not necessary to interpret the direction exactly identical to the gravity. In the light of the invention, it is proper to read that the vertical direction means a parallel direction along a direction in which the unit is detached/attached. Further, it is noted that, where the image forming apparatus is installed in a vertical way, which is upright, the vertical direction above means a horizontal direction according to the direction in which the unit is detached/attached. It is also noted that, where the image forming apparatus is installed with an angle (or inclined), the vertical direction inclines accordingly. Therefore, the vertical direction position regulation part may be defined as a unit direction regulation part that functions to regulate it in the detachable/attachable direction of the detachable unit.

The first engagement parts 911a and 911b of the detachable unit 60 are respectively formed as the round shaped shaft to abut in the width direction. The first engagement parts 911a and 911b fit inside of the ditch parts 901a and 901b disposed on the corresponding side frames 21a and 21b.

Also, the second engagement parts 912a and 912b of the detachable unit 60 are formed as the flat board form protrusion part to respectively protrude in the width direction. The second engagement parts 912a and 912b mount on the protrusion parts 902a and 902b disposed on the corresponding side frames 21a and 21b.

The ditch part 901a and 901b of the side frame 21a and 21b engage with the first engagement part 911a and 911b of the detachable unit 60, so the image forming apparatus 1 regulates the position of the direction toward the sheet metal 26 of the detachable unit 60, that is, the position of the horizontal direction of the detachable unit 60. Also, the abutment part 902a and 902b of the side frames 21a and 21b engage with the second engagement part 912a and 912b of the detachable unit 60, so the image forming apparatus 1 regulates the position of the detachable unit 60 in the vertical direction.

As a result, when the detachable unit 60 is installed in the main body frame 2, the image forming apparatus 1 can position the detachable unit 60 at the predetermined position inside of the main body frame 2.

The detachable unit 60 is positioned at the predetermined position when it is installed in the main body frame 2. The position of the detachable unit 60 at this time is the position that the abutment part 610a disposed on the sheet guide 610 faces the guide position part 26a of the sheet metal 26 (refer to FIG. 1).

The sheet guide 610, as described above, has a configuration to be able to rotate and move as the shaft part 606 (refer to FIG. 3) is the center. FIGS. 5A and 5B illustrate the movement of the sheet guide 610. FIG. 5A illustrates the state that the sheet guide 610 leans in the slant direction as the shaft 606 is the center, and FIG. 5B illustrate the state the sheet guide 610 stands up in the perpendicular direction as the shaft 606 is the center.

As illustrated in FIG. 5A, the opening part 610x is disposed near the lower end part of the sheet guide 610. The shaft part 606 disposed in the waste toner box 605 fits inside the open-

ing part 610x. The opening part 610x and the shaft part 606 are formed in the circular shape of which the diameters are about same. The shaft 606 rotatably movably supports the sheet guide 610 by fitting inside of the opening part 610x of the sheet guide 610. Therefore, the opening part 610x (the shaft 606) functions as a rotary movement fulcrum of the sheet guide 610.

The sheet guide 610 is provided with the position lever 610z near the lower end part. The position lever 610z is a part to determine the rotary movement position (angle) of the sheet guide 610. A part near the lower end part of the sheet guide 610 protrudes from the shaft part 606 in one direction. Thereby, the position lever 610z is formed.

In contrast, the detachable unit 60 is provided with the first lever positioning part 607a (refer to FIG. 5A) to contact the tip of the positioning lever 610z and position the protrusion part 610a of the sheet guide 610 at the predetermined position (the first position P1 described later (refer to FIG. 6) and the second lever positioning part 607b (refer to FIG. 5B) to contact the tip of the positioning lever 610z and position the protrusion part 610a of the sheet guide 610 at the predetermined position (the second position P2 (refer to FIG. 6)).

The positioning lever 610z rotates and moves around the shaft part 606 (the opening part 610x) of the sheet guide 610. As a result, the positioning lever 610z can rotate and move between the first lever positioning part 607a and the second lever positioning part 607b, which are disposed in the waste toner box 605 as the shaft 606 (the opening part 610x) is the center.

Here, in the explanation, the position that the tip of the position lever 610z touches the first lever position part 607a of the waste toner box 605 is "the first position P1" (refer to FIG. 6), and the position that the tip of the position lever 610z touches the second lever position part 607b of the waste toner box 605 is "the second position P2" (refer to FIG. 6). Therefore, the positioning lever 610z can rotate and move between the first position P1 and the second position P2 when the shaft 606 is the center.

In the first embodiment, an angle $\theta 2$ between the line connects the second position P2 and the shaft 606 (hole 610x) and the horizontal direction is larger than another angle $\theta 1$ between the line connects the first position P1 and the shaft 606 (hole 610x) and the horizontal direction. Herein, these two angles are at a side facing the guide position part 26a of the sheet metal 26.

The detachable unit 60 is provided with the flat spring 615 as a bias member to bias the sheet guide from the second position P2 toward the first position P1. As illustrated in FIG. 5B, the fixed end 615a of the flat spring 615 is fixed on the transfer part 600, and the free end 615b side of the flat spring 615 engages with the engagement part 610e of the sheet guide 600. Thereby, the flat spring 615 biases the sheet guide 610 in the direction the arrow D orients that is the direction of the first position P1 (the direction that the abutment part 610a of the sheet guide 610 contacts the sheet metal 26 as the position part).

In this embodiment, as illustrated in FIG. 5A, when the external power is not applied, the sheet guide 610 of the detachable unit 60 is in the state that the first contacted surface 610za of the positioning lever 610z contacts the first lever positioning part 607a of the waste toner box 605 and the rotation and the movement of the sheet 610 are regulated at the first position P1.

In contrast, as illustrated in FIG. 5B, when the external power is applied, the sheet guide 610 of the detachable unit 60 is in the state that the second contacted surface 610zb of the position lever 610z contacts the second lever position part

607b of the waste toner box 605 and the rotation and the movement of the sheet guide 610 are regulated at the second position P2.

In the image forming apparatus 1, the sheet guide 610 also functions as the handle part 610c is disposed to be able to rotate and move on the detachable unit 60 that has a configuration to be able to attach and detach with respect to the main body frame 2. And, the detachable unit 60 is installed in the main body frame 2, so the abutment part 610a of the sheet guide 610 abuts the guide position part 26a of the sheet metal 26 of the main body frame 2, and the position of the image forming apparatus 1 is regulated. As a result, by installing the detachable unit 60 in the main body frame 2, the image forming apparatus 1 can position the sheet guide 610 at the predetermined position at the same time.

Thereby, the image forming apparatus can maintain the position accuracy of the sheet guide 610 with respect to the before and after mechanisms (here, the sheet carrying roller 401a and 401b of the sheet carrying part 400, the toner image forming part 510, and the transfer part of the image forming part 500) high.

In the first embodiment, the detachable unit 60 is configured as a sheet carrying unit to carry the sheet 101, and the detachable unit 60 as a sheet carrying unit is configured as a belt carrying unit provided with the endless carrying belt 603 and a plurality of the rollers 601, 602, and 604. However, the detachable unit 60 can also be configured as a unit, for example, a fuser unit, a double sided print unit and the like, instead of a sheet carrying unit.

Movement of Image Forming Apparatus

The movement of the image forming apparatus 1 according to the first embodiment is explained. Here, first of all, the whole movement of the image forming apparatus 1 is explained, and next, the movement around the detachable unit 60 is explained.

First of all, referring to FIG. 1 and FIG. 2, the whole movement of the image forming apparatus 1 is explained. The image forming apparatus 1 receives the print data from the host device (not illustrated). Then, in the image forming apparatus 1, the toner image forming part 510 (refer to FIG. 2) makes the photosensitive drum 511 rotate and conducts the image (toner image) forming treatment.

At that time, in the image forming apparatus 1, the charge roller 512 equally charges the surface of the photosensitive drum 511. Then, the LED head 520 partially exposes the surface of the photosensitive drum 511 based on the print data. Thereby, the image forming apparatus 1 forms the electrostatic latent image on the surface of the photosensitive drum 511.

In contrast, in the image forming apparatus 1, the toner is supplied to the supply roller 514 from the toner contain part 516 in advance. When the development roller 513 rotates accompanied by the rotation of the photosensitive drum 511, the supply roller 514 supplies the toner to the development roller 513 and makes the toner adhere to the surface of the development roller 513. The toner adhered on the surface of the development roller 513 contacts the development blade 515 accompanied by the rotation of the development roller 513, and the thickness of the toner is regulated.

After this, in the image forming apparatus 1, the development roller 513 supplies the toner to the photosensitive drum 511. At this time, the toner adheres on the electrostatic latent image formed on the surface of the photosensitive drum 511. Thereby, the toner image is formed on the surface of the photosensitive drum 511.

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In the image forming apparatus 1, when the toner image is formed on the surface of the photosensitive drum 511, the transfer part 600 conducts the transfer treatment. At that time, in the transfer part 600, while the carrying belt 603 carries the sheet 101, the transfer roller 604 pulls the toner image formed on the surface of the photosensitive drum 511. As a result, the toner image is transferred from the photosensitive drum 511 to the sheet 101.

When the toner image is transferred from the photosensitive drum 511 to the sheet 101, the image forming apparatus 1 carries the sheet 101 to the fuser part 700 (refer to FIG. 1). When the sheet 101 is carried, the fuser part 700 conducts the fuser treatment. At that time, the fuser part 700 heats and pressurizes the sheet 101 and makes the toner image transferred to the surface of the sheet 101 melt and secure on the sheet 101.

When the toner image is secured on the sheet 101, the image forming apparatus 1 carries the sheet 101 to the stack part 805 and ejects it on the stack part 805. The whole movement of the image forming apparatus 1 is described above.

Next, referring to FIGS. 6, 7, 8, and 9, the movement around the detachable unit 60 of the image forming apparatus 1 according to the first embodiment is explained. FIGS. 6, 7, 8, and 9 are views illustrating the movement of the image forming apparatus 1 according to the first embodiment.

(Movement of Detachable Unit at Time of Installation)

First of all, the movement of the detachable unit 60 of the image forming apparatus 1 at the time of installation is explained. FIG. 6 illustrates the movement of the image forming apparatus 1 when the detachable unit 60 is installed into the main body frame 2.

In the detachable unit 60, the flat spring 615 (refer to FIGS. 5A and 5B) always biases the sheet guide 610 from the second position P2 (refer to FIG. 6) to the first position P1 (refer to FIG. 6). Therefore, as illustrated in FIG. 6, when the detachable unit 60 is removed from the main body frame 2, the sheet guide 610 rotates and moves from the second position P2 to the first position P1 by accepting the bias power from the flat spring 615. As a result, the sheet guide 610 is in the state that the first contacted part 610za (refer to FIG. 5B) of the position layer 610z contacts the first lever position part 607a (refer to FIG. 5A). Thus, when the detachable unit 60 is removed from the main body frame 2, the abutment part 610a of the sheet guide 610 is positioned at the first position P1.

The user grips the handle part 610c of the sheet guide 610, carries the detachable unit 60 in the vicinity of the main body frame 2, and installs the detachable unit 60 into the main body frame 2. At that time, while rotating the sheet guide 610 from the first position P1 (refer to FIG. 6) to the second position P2 (refer to FIG. 6), the user installs the detachable unit 60 into the main body frame 2.

After installing the detachable unit 60 into the main body frame 2, the user release his/her hand from the handle part 610c of the sheet guide 610. At this time, the sheet guide 610 rotates and moves from the second position P2 to the first position P1 by accepting the bias power from the flat spring 615. Thereby, the sheet guide 610 is in the state that the abutment part 610a contacts the guide position part 26a of the sheet metal 26 of the main body frame 2.

After this, the detachable unit 60 enters inside of the main body frame 2 and is positioned at the predetermined position. At that time, accompanied by the movement of the detachable unit 60, in the sheet guide 610, the abutment part 610a is pressured by the guide position part 26a of the sheet metal 26 of the main body frame 2, and pushed back from the first position P1 to the second position P2. As a result, the abutment part 610a of the sheet guide 610 is positioned between

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the first position P1 and the second position P2 (hereinafter referred to as "the third position P3 (refer to FIG. 6)"). Thus, when the detachable unit 60 is installed into the main body frame 2, the abutment part 610a of the sheet guide 610 moves from the first position P1 to the third position P3 and is positioned at the third position P3.

(Movement at Time of Printing)

Next, the movement of the image forming apparatus 1 at the time of printing is explained. At the time of printing, the image forming apparatus 1 conducts the image (toner image) forming treatment, the transfer treatment, and the fuser treatment. FIG. 7 illustrates the carrying movement of the sheet 101 from the sheet carrying part 400 to the image forming part 500 conducted at the time of printing.

The motor disposed in the main body frame 2 (not illustrated) drives, so, in the image forming apparatus 1, the sheet delivery part 200 delivers the sheet 101 from the sheet tray 100 toward the sheet carrying part 400, and the sheet carrying rollers 401a and 401b of the sheet carrying part 400 carries the sheet 101 toward the image forming part 500.

At this time, the sheet 101 is guided between the guide part 610b of the sheet guide 610 disposed in the detachable unit 60 and the carrying part guide 410 disposed in the sheet carrying part 400 by the guide part 610b and the carrying guide 410, and carried toward the image forming part 500.

After this, the carrying belt 603 carries the sheet 101 toward the fuser part 700. At that time, the sheet 101 passes between the guide surface 510a formed at the lower end part of the toner image forming part 510 of the image forming part 500 and the carrying belt 603, and passes between the photosensitive drum 511 of the toner image forming part 510 and the transfer roller 604 of the fuser part 600. At this time, the toner image is transferred to the surface of the sheet 101 from the photosensitive drum 511.

The image forming apparatus 1 has four toner image forming parts 510. When the color printing is conducted, the image forming apparatus 1 piles each color of the toner images of black, yellow, magenta, and cyan respectively formed on four toner image forming parts 510 and transfers them to the sheet 101. Thereby, the color image is formed on the surface of the sheet 101.

After this, the sheet 101 is heated and pressurized at the transfer part 700. Thereby, the toner image is secured on the sheet 101. After securing the toner image on the sheet 101, the image forming apparatus 1 carries the sheet 101 toward the stack part 805 and ejects it on the stack part 805.

(Movement of Detachable Unit at Time of Removal)

Next, the movement of the image forming apparatus 1 at the time of removal of the detachable unit 60 is explained. FIG. 8 and FIG. 9 illustrate the movements of the image forming apparatus 1 when the detachable unit 60 is removed from the main body frame 2.

When the user removes the detachable unit 60 from the main body frame 2, the user grips the handle part 610c of the sheet guide 610 and gives the external power to resist the bias power of the flat spring 615 acting from the second position P2 (refer to FIG. 6) to the first position P1 (refer to FIG. 6) to the sheet guide 610.

Thus, when the detachable unit 60 is removed from the main body frame 2, the sheet guide 610 receives the external power acting from the first position P1 to the second position P2 by the user.

Therefore, the sheet guide 610 is in the state that the second contacted part 610zb (refer to FIG. 5A) of the position lever 610z contacts the second lever position part 607b (refer to FIG. 5B). As a result, the abutment part 610a of the sheet

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guide **610** moves its position from the third position P3 (refer to FIG. 6) to the second position P2 (refer to FIG. 6).

Thereby, the user can pull out the detachable unit **60** in the upper direction of the main body frame **2**, that is, can attach and detach the detachable unit **60** from the main body frame **2**.

After attaching and detaching the detachable unit **60** from the main body frame **2**, the user releases his/her hand from the handle part **610c** of the sheet guide **610**. Then, the sheet guide does not receive the external power from the user.

At this time, the sheet guide **610** receives the bias power from the flat spring **615** and rotates and moves from the second position P2 (refer to FIG. 6) to the first position P1 (refer to FIG. 6). Thereby, the sheet guide **610** is in the state that the first contacted part **610za** (refer to FIG. 5B) contacts the first lever position part **607a** (refer to FIG. 5A). As a result, the abutment part **610a** of the sheet guide **610** moves its position from the second position P2 (refer to FIG. 6) to the first position P1 (refer to FIG. 6).

In the image forming apparatus **1** according to the first embodiment, the sheet guide **610** also functions as the handle part **610c** is disposed in the detachable unit **60** so as to be able to rotate and move. And, the detachable unit **60** is installed into the main body frame **2**, so the abutment part **610a** of the sheet guide **610** abuts the guide position part **26a** of the sheet metal **26** on the main body frame **2**, and the position of the image forming apparatus **1** is regulated. As a result, the detachable unit **60** is installed into the main body frame **2** so that the image forming apparatus **1** can position the sheet guide **610** at the predetermined position at the same time.

Such image forming apparatus **1** has a configuration that the detachable unit **60** and the sheet guide **610** are positioned together accompanied by the installation movement of the detachable unit **60**. Therefore, the image forming apparatus **1** can maintain the position accuracy of the sheet guide **610** with respect to the before and after mechanisms (here, the sheet carrying roller **401a** and **401b** of the sheet carrying part **400**, the toner image forming part **510** of the image forming part **500**, and the transfer part **600**) high. As a result, the image forming apparatus **1** can improve the carrying performance.

Also, in the image forming apparatus **1**, the sheet guide **610** is disposed in the detachable unit **60**, so the sheet guide **610** can be arranged in the vicinity of the toner image forming part **510**. Therefore, the image forming apparatus **1** can also further improve the carrying performance by this.

Also, in the image forming apparatus **1**, the sheet guide **610** has the handle part **610c** as a grip part. Thereby, using the space to mount the grip part to grip the detachable unit **60**, the image forming apparatus **1** can mount the sheet guide **610**. Therefore, the image forming apparatus **1** can downsize the main body frame **2**.

According to the image forming apparatus **1** described above, the detachable unit **60** is installed in the device main body (main body frame **2**) so that the sheet guide **610** can be positioned at the predetermined position at the same time.

Second Embodiment

Referring to FIG. 10 and FIG. 11, the configuration of the image forming apparatus **1B** according to the second embodiment is explained. FIGS. 10 and 11 are views illustrating the configuration of the image forming apparatus according to the second embodiment.

Compared to the image forming apparatus **1** (refer to FIG. 2) according to the first embodiment, the image forming apparatus **1B** according to the second embodiment is different because the sensor lever **430** and the sensor (not illus-

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trated) are disposed in the sheet carrying part **400**. Other configurations are same as the image forming apparatus **1** according to the first embodiment.

The sensor lever **430** and the sensor (not illustrated) are configuration elements for the control part (not illustrated) of the image forming apparatus **1B** to detect the position of the sheet **101**. The tip of the sensor lever **430** is disposed in the sheet carrying part **400** rockably arranged at the side of the main body frame **2** (device main body) (refer to FIG. 1). When the sheet **101** carried by the sheet carrying rollers **401a** and **401b** of the sheet carrying part **400** touches the tip of the sensor lever **430**, the sensor lever **430** inclines. The sensor (not illustrated) outputs the signal to show the inclination of the tip of the sensor lever **430** to the control part (not illustrated). Thereby, the control part (not illustrated) detects that the tip of the sheet **101** reached the position of the sensor lever **430**.

As illustrated in FIGS. 10 and 11, the sensor lever **430** is arranged at the downstream position of the sheet rollers **401a** and **401b** and also at the position to overlap with the sheet guide **610** to guide the traveling of the sheet **101** in the vertical direction. In the second embodiment, the sensor lever **430** is arranged between the two guide parts **610b** of the sheet guide **610**. The sensor (not illustrated) is arranged around the tip of the sensor lever **430**.

Referring to FIG. 12, the movement of the image forming apparatus **1B** is explained. FIG. 12 is a view illustrating the movement of the image forming apparatus **1B** according to the second embodiment.

At the time of printing, same as the image forming apparatus **1** according to the first embodiment, the image forming apparatus **1B** is in the state that the sheet guide **610** is pushed by the guide position part **26a** of the sheet metal **26** of the main body frame **2**, and the abutment part **610a** of the sheet guide **610** is positioned at the third position (refer to FIG. 6).

At the time of printing, same as the image forming apparatus **1** according to the first embodiment, in the image forming apparatus **1B** according to the second embodiment, the motor (not illustrated) disposed in the main body frame **2** drives, so the sheet delivery part **200** delivers the sheet **101** from the sheet tray **100** to the sheet carrying part **400**, and the sheet carrying rollers **401a** and **401b** of the sheet carrying part **400** carry the sheet **101** toward the image forming part **500**.

At that time, in the image forming apparatus **1B**, the sheet **101** carried by the sheet carrying rollers **401a** and **401b** contacts the tip of the sensor lever **430** and presses the tip of the sensor lever **430**. As a result, the tip of the sensor lever **430** inclines in the direction of the toner image forming part **510** of the image forming part **500**. The sensor (not illustrated) of the image forming apparatus **1B** outputs the signal to show the inclination of the tip of the sensor lever **430** to the control part (not illustrated) of the image forming apparatus **1B**. Thereby, the control part (not illustrated) detects that the tip of the sheet **101** reached the position of the sensor lever **430**. The control part (not illustrated) feeds the position of the tip of the sheet **101** back to the control of the position to write out the image.

In the image forming apparatus **1B** according to the second embodiment, same as the image forming apparatus **1** according to the first embodiment, the sheet guide **610** is disposed in the detachable unit **60**. Then, in the image forming apparatus **1B**, the detachable unit **60** is installed in the main body frame **2**, so the abutment part **610a** of the sheet guide **610** abuts the guide position part **26a** of the sheet metal **26** of the main body frame **2**, and the position of the image forming apparatus **1B** is regulated. As a result, the detachable unit **60** is installed in

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the main body frame **2** so that the image forming apparatus **1B** can position the sheet guide **610** at the predetermined position at the same time.

Such image forming apparatus **1B**, same as the image forming apparatus **1** according to the first embodiment, has a configuration that the detachable unit **60** and the sheet guide **610** are positioned together. Therefore, same as the image forming apparatus **1** according to the first embodiment, the image forming apparatus **1B** can maintain the position accuracy of the sheet guide **610** with respect to the before and after mechanisms (here, the sheet carrying rollers **401a** and **40b** of the sheet carrying part **400**, the toner image forming part **400** of the image forming part **500**, and the transfer part **600**) high. As a result, the image forming apparatus **1B** can improve the carrying performance and the position accuracy to write out the image.

Also, in the image forming apparatus **1B**, same as the image forming apparatus **1** according to the first embodiment, the sheet guide **610** is disposed in the detachable unit **60**, so the sheet guide **610** can be arranged in the vicinity of the toner image forming part **510**. Therefore, same as the image forming apparatus **1** according to the first embodiment, the image forming apparatus **1B** can also improve the carrying performance and the position accuracy to write out the image by this.

Furthermore, in the image forming apparatus **1B**, different from the image forming apparatus **1** according to the first embodiment, the sensor lever **430** is arranged at the position to overlap the sheet guide **610** to guide the traveling of the sheet **101** in the vertical direction. Therefore, the image forming apparatus **1B** can improve the detection accuracy of the position of the tip of the sheet **101** by the sensor lever **430**. As a result, the image forming apparatus **1B** can also further improve the carrying performance and the position accuracy to write out the image by this.

The present invention is not limited to the embodiments described above, but can be changed or transformed as far as the content of the present invention is not deviated. For example, the present invention can be used not only as a printer, but also as a facsimile machine, a multifunction machine, and a image forming apparatus of MFP and the like. "MFP" means the Multi Function Printer to which functions as a facsimile, a scanner, a copier and the like are added.

Also, for example, in the first and the second embodiments, the detachable unit **60** configured as a belt carrying unit that is one form of the sheet carrying units is explained. However, the present invention is also applicable when the detachable unit **60** is configured as a fuser unit, a double side print unit, or the like, that is a unit to be able to attach and detach, instead of the belt carrying unit.

Also, for example, in the detachable unit **60**, one part of the configuration can be transformed. FIG. **13** is a view illustrating the configuration of the detachable unit **60c** according to the modification example. Compared to the detachable unit **60** according to the first and the second embodiments, the detachable unit **60c** according to the modification example is different because the sheet guide **620** is used instead of the sheet guide **610**. As illustrated in FIG. **3**, the sheet guide **620** is provided with the abutment part **620a**, the guide part **620b**, and the handle part **620c**. The abutment part **620a**, the guide part **620b**, and the handle part **620c** are respectively same configuration elements as the abutment part **610a**, the guide part **610b**, and the handle part **610c** according to the first and the second embodiments. The abutment part **620a** has the same shape as the abutment part **610a** according to the first and the second embodiments. On the other hand, different from the guide part **610b** according to the first and the second

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embodiments, the undersurface of the lower end part of the guide part **620b** is formed in the flat shape across the whole width in the lateral direction. Also, different from the handle part **610c** according to the first and the second embodiments, the handle part **620c** has the shape that the girth of the handle part **620c** is not divided by the guide part **610b**. The sheet guide **620** contacts the sheet **101** by the abutment part **620a** formed in the flat shape across the whole width in the lateral direction.

What is claimed is:

1. An image forming apparatus, comprising:

a device main body that includes a guide position part;
a detachable unit that is detachable and attachable to the device main body; and

a sheet guide that is rotatably attached to the detachable unit and that guides a pathway of sheet,
wherein the guide position part regulates a position of the sheet guide,

when the detachable unit is mounted on the device main body, a position of the sheet guide is regulated by abutting the guide position part,

the device main body further comprises

a sheet carrying direction regulation part that regulates a position of the detachable unit in a sheet carrying direction,

a unit direction regulation part that regulates a position of the detachable unit in a detachable/attachable direction of the detachable unit, and

the detachable unit comprises a first engagement part that engages the sheet carrying direction regulation part and a second engagement part that engages the unit direction regulation part.

2. The image forming apparatus according to claim **1**, wherein

the detachable unit comprises a first lever position part and a second lever position part,

the first lever position part contacting the sheet guide at a first position, and

a second lever position part contacting the sheet guide at a second position that is different from the first position.

3. The image forming apparatus according to claim **2**, wherein

when the detachable unit is installed in the device main body, the sheet guide contacts the guide position part at a third position that is between the first position and the second position.

4. The image forming apparatus according to claim **1**, wherein

the detachable unit includes a bias part that biases the sheet guide in a direction from a second position towards a first position.

5. An image forming apparatus, comprising:

a device main body that includes a guide position part;
a detachable unit that is detachable and attachable to the device main body; and

a sheet guide that is rotatably attached to the detachable unit and that guides a pathway of sheet, the sheet guide rotatable about a rotational axis;

wherein the guide position part regulates a position of the sheet guide,

when the detachable unit is mounted on the device main body, a position of the sheet guide is regulated by abutting the guide position part,

a part of the sheet guide is configured as a handle part of the detachable unit,

the sheet guide includes a guide part that contacts the sheet, and

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the guide part is positioned between and abutment position between the sheet guide and the guide position part, and the rotational axis of the sheet guide.

6. The image forming apparatus according to claim 5, wherein

the detachable unit comprises a first lever position part and a second lever position part,
the first lever position part contacting the sheet guide at a first position, and
a second lever position part contacting the sheet guide at a second position that is different from the first position.

7. The image forming apparatus according to claim 6, wherein

when the detachable unit is installed in the device main body, the sheet guide contacts the guide position part at a third position that is between the first position and the second position.

8. The image forming apparatus according to claim 1, further comprising:

a detection member that detects a tip of a sheet, wherein when the detachable unit is mounted in the device main body and when the sheet guide contacts the guide position part, the detection member is positioned perpendicularly below an area in which the sheet guide regulates an image forming surface side of the sheet when viewed in a direction orthogonal to the sheet carrying direction.

9. The image forming apparatus according to claim 5, further comprising:

a detection member that detects a tip of a sheet, wherein when the detachable unit is mounted in the device main body and when the sheet guide contacts the guide position part, the detection member is positioned perpendicularly below an area in which the sheet guide regulates an image forming surface side of the sheet when viewed in a direction orthogonal to a sheet carrying direction.

10. The image forming apparatus according to claim 5, wherein

the sheet guide includes a plurality of guide parts that guides the sheet by contacting the sheet, and
the handle part is positioned between adjacent guide parts.

11. The image forming apparatus according to claim 5, wherein

the detachable unit includes a bias part that biases the sheet guide in a direction from the second position towards the first position.

12. An image forming apparatus, comprising:

a device main body;

a detachable unit that is detachable and attachable to the device main body;

a sheet guide that guides a pathway of sheet; and

a guide position part that regulates a position of the sheet guide, wherein

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the guide position part is disposed in the device main body, the sheet guide is disposed movably with respect to the detachable unit,

when the detachable unit is mounted on the device main body, a position of the sheet guide is regulated by abutting the guide position part,

the detachable unit comprises a first lever position part and a second lever position part,

the first lever position part contacting the sheet guide at a first position, and

the second lever position part contacting the sheet guide at a second position that is different from the first position.

13. The image forming apparatus according to claim 12, wherein

the sheet guide is disposed rotatably and movably around a shaft part that is disposed in the detachable unit.

14. The image forming apparatus according to claim 12, wherein

when the detachable unit is installed in the device main body, the sheet guide contacts the guide position part at a third position that is between the first position and the second position.

15. The image forming apparatus according to claim 12, further comprising:

a detection member that detects a tip of a sheet, wherein when the detachable unit is mounted in the device main body and when the sheet guide contacts the guide position part, the detection member is positioned perpendicularly below an area in which the sheet guide regulates an image forming surface side of the sheet when viewed in a direction orthogonal to a sheet carrying direction.

16. The image forming apparatus according to claim 15, wherein

the detection member is disposed at an upstream side in the sheet carrying direction of the sheet with respect to the detachable unit.

17. The image forming apparatus according to claim 12, wherein

the sheet guide is disposed on the detachable unit freely rotatably about a rotational axis,

the sheet guide includes a position lever that protrudes in a predetermined direction from the rotational axis, and

an angle $\theta 2$ formed by a horizontal line and the position lever at the second position is larger than an angle $\theta 1$ formed by the horizontal line and the position lever at the first position.

18. The image forming apparatus according to claim 12, wherein

the detachable unit includes a bias part that biases the sheet guide in a direction from a second position towards a first position.

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